State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-135
Relating to Exemptions under Section 27156
of the Vehicle Code

DIESEL RESEARCH AND DEVELOPMENT CORPORATION
TURBOCHARGER KIT NO. 4B2
(MERCEDES BENZ 240D)

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-5;

IT IS ORDERED AND RESOLVED: That the installation of the add-on turbocharger kit number 4B2 (using a 0.4 A/R ratio Rotomaster/Rajay turbocharger) manufactured by Diesel Research and Development Corporation, of 2741 Toledo Street, Suite 218, Torrance, California 90503, has been found not to reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for 1983 and older model-year Mercedes Benz 240D vehicles powered by a four-cylinder diesel engine.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those submitted by the device manufacturer.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board. Exemption of a kit shall not be construed as an exemption to sell, offer for sale, or advertise any component of a kit as an individual device.

This Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE DIESEL RESEARCH AND DEVELOPMENT ADD-ON TURBOCHARGER KIT NO. 4B2.

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

> "43644. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at El Monte, California, this 11th day of August, 1983.

K. D. Drachand, Chief
Mobile Source Control Division

STATE OF CALIFORNIA

AIR RESOURCES BOARD

# EVALUATION OF DIESEL RESEARCH AND DEVELOPMENT CORPORATION'S TURBOCHARGER KIT NO. 4B2 FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13 of THE CALIFORNIA ADMINISTRATIVE CODE

AUGUST 8, 1983

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# EVALUATION OF DIESEL RESEARCH AND DEVELOPMENT CORPORATION'S TURBOCHARGER KIT NO. 4B2 FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13 OF THE CALIFORNIA ADMINISTRATIVE CODE

by

MOBILE SOURCE CONTROL DIVISION

State of California
AIR RESOURCES BOARD
9528 Telstar Avenue
El Monte, CA 91731

## SUMMARY

Diesel Research and Development Corporation (DRDC) has applied for exemption of an add-on turbocharger kit from the prohibitions in Vehicle Code Section 27156. The kit, turbocharger kit number 4B2, is intended for installation on 1983 and older model-year Mercedes Benz 240D models powered by a four-cylinder diesel engine of 146 CID.

Emission test results submitted by DRDC and generated at the ARB test facility indicate that the add-on turbocharger kit number 4B2 will not significantly affect emission from vehicles for which exemption is requested.

Based on the above, the staff recommends that DRDC be granted an exemption as requested and that Executive Order D-135 be granted.

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## I. INTRODUCTION

Diesel Research and Development Corporation (DRDC), of 2741 Toledo Street, Suite 218, Torrance, California 90503, has applied for exemption of an add-on turbocharger kit from the prohibitions in Vehicle Code Section 27156. The kit, turbocharger kit number 4B2, is intended for installation on 1983 and older model-year Mercedes Benz 240D models powered by a four-cylinder diesel engine of 146 cubic inch displacement.

DRDC has submitted data from back-to-back emission tests conducted on a 1982 Mercedes Benz 240D at FCI International Testing Laboratory in Santa Ana, California. Confirmatory tests were conducted on the same vehicle at the Air Resources Board (ARB) laboratory in El Monte, California.

## II. CONCLUSION

Emission test results submitted by DRDC and generated at the ARB test facility indicate that the add-on turbocharger kit number 4B2 will not significantly affect emissions from vehicles for which exemption is requested.

## III. RECOMMENDATIONS

Based on the above conclusion, the staff recommends that DRDC be granted an exemption as requested and that Executive Order D-135 be granted.

## IV. TURBOCHARGER KIT DESCRIPTION AND OPERATION

The purpose of turbocharging is to increase the volumetric efficiency of an engine. The major components of the DRDC turbocharger kit number 4B2 are a 0.4 A/R ratio Rotomaster/Rajay turbocharger, an air filter box, a replacement cast aluminum intake manifold, and a replacement cast iron exhaust manifold. The components are packaged with installation hardware and instructions and sold as a kit.

The original equipment manufacturer's (OEM) exhaust manifold is replaced by the DRDC iron manifold. The turbine inlet of the turbocharger mounts directly on the replacement manifold. The turbine, driven by exhaust gases, is linked to the compressor by a solid shaft. Intake air is drawn through the add-on air filter and compressed by the compressor. Compressed air is then fed into the engine through the DRDC cast aluminum intake manifold.

Maximum positive manifold pressure (boost) is limited to 12 psig by the size of (and exhaust flow through) the turbine housing. No wastegate or other active boost limiting device is used.

The cooling of the turbocharger is achieved by lubricating oil passing through the unit. The oil is delivered (using a special oil supply line) from a hole tapped at the oil filter cover plate to the turbocharger bearing housing. Oil is returned gravitationally to the engine oil pan.

No modifications to the OEM tune-up specifications are required or permitted when the turbocharger kit is installed.

## V. TURBOCHARGER KIT EVALUATION

A 1982 Mercedes Benz 240D model powered by a four-cylinder diesel engine was used for the evaluation of the turbocharger kit. A description of the vehicle and test parameters is given in the Appendices.

Evaluation consisted of comparative (without and with the kit installed on the test vehicle) cold-start CVS-75 and hot-start Highway Fuel Economy tests for measuring exhaust emissions and fuel economy. Tests were performed under contract for DRDC by FCI International Testing Laboratory and confirmed by the Air Resources Board laboratory. A synopsis of the test data is tabulated in the Appendices.

## VI. DISCUSSION

Due to the high cost and availability of obtaining a Mercedes Benz as a test vehicle, and the fact that the 1983 Mercedes Benz 240D models are carry-over (identical engine design) from the 1982 model-year, the staff accepted a 1982 model as a test vehicle. Exemption coverage is requested for 1983 and older model-year Mercedes Benz 240D models.

The comparative CVS-75 emissions test data generated by the Air Resources Board show increases of hydrocarbon emissions (0.07 grams per mile) with the turbocharger installed. Because of limited applications of this turbocharger (Mercedes Benz 240D models only), the overall emissions impact is considered by the staff insignificant. The above results satisfy the Air Resources Board's requirements for granting DRDC an exemption for their 4B2 turbocharger kit as requested.

# APPENDICES

Table 1

Description of Test Vehicle

| | |
|---|---|
| Model-Year: | 1982 |
| Vehicle Manufacturer: | Mercedes Benz |
| Vehicle Model: | 240D |
| Engine Size: | 146 CID, diesel |
| Test Weight: | 3500 lbs. |
| Dyno Load: | 12.6 hp. |

Table 2

Applicant's Exhaust Emission Test Data

Evaluation of DRDC Turbo Kit 4B2

1982 Mercedes Benz 240D

| Test | Exhaust Emissions (g/mi) HC | CO | NOx | Fuel Economy (mpg) Urban | Hwy |
|---|---|---|---|---|---|
| Baseline | 0.21 | 0.7 | 1.4 | 21.4 | 25.7 |
| Device | 0.21 | 0.7 | 1.5 | 22.3 | 25.5 |

Table 3

ARB's Exhaust Emission Test Data
Evaluation of DRDC Turbo Kit 4B2
1982 Mercedes Benz 240D

| Test | Exhaust Emissions (g/mi) HC | CO | NOx | Fuel Economy (mpg) Urban | Hwy |
|---|---|---|---|---|---|
| Baseline | 0.15 | 0.8 | 1.4 | 26.2 | 28.9 |
| Baseline | 0.16 | 0.8 | 1.4 | 26.1 | 29.3 |
| Average | 0.16 | 0.8 | 1.4 | 26.2 | 29.1 |
| Device | 0.23 | 0.8 | 1.5 | 27.2 | 29.4 |
| Device | 0.23 | 0.8 | 1.5 | 26.9 | 29.9 |
| Average | 0.23 | 0.8 | 1.5 | 27.1 | 29.7 |